Nuclear Science Week

How Much Radiation?

OBJECTIVE:
To determine how much radiation dose comes from nature and how much comes from the uses of radiation in society.

Grade: 6-12

Intended Learning Outcome:

- Reason mathematically
- Make predictions
- Collect and record data
- Create tables and graphs to describe and summarize data

Subject: Science, Math

Materials:

- Personal radiation dose chart (attached)

Teaching Time: approximately 20 minutes

Number of Players/Students: individual or whole class

Teacher Information: A mrem (millirem) of background radiation is equivalent to absorbing 100 ergs in 1 gram of material, e.g., body tissue.

Procedure: Follow directions on the Personal Radiation Dose Chart.

Analysis and Results:

1) Calculate the radiation from "Where you Live."
2) Calculate the radiation from "What You Eat, Drink, and Breathe."
3) Calculate the radiation from "How You Live and Choices You Make."
4) Add up the values to give a total does in mrems.

Assessment: Have the students compare this with an average

US value of 360 mrems. Ask students the following questions:

1) How could you decrease your exposure to background radiation?
2) What careers could increase your exposure to radiation?
3) How can you share this information with your family?

PERSONAL RADIATION DOSE CHART

(adapted from American Nuclear Society)

We live in a radioactive world and always have. Radiation is all around us as part of our natural environment. The annual average dose of radiation per person in the United States is about 300 mrems (millirems). National standards allow up to 5,000 mrems / year dose for those who work with and around radioactive materials.

The following chart will help you estimate you average annual dose in mrems.

RADIATION FROM:	**AVERAGE DOSE** (mrems)	
WHERE YOU LIVE		
Cosmic Radiation from Outer Space at 5,000 feet		+ 47
Terrestrial Radiation from the Land		
States Bordering Gulf or Atlantic Coasts.	+ 23	+_____
New Mexico, Utah, Colorado, or Wyoming	+ 90	+_____
All other states	+ 46	+_____
If you live in a stone, brick, concrete or adobe building	+ 7	+_____
WHAT YOU EAT, DRINK, AND BREATHE		
Internal radiation from food and water and your body	+ 40	+_____
From radon in the air we breathe	+ 160	+_____
HOW YOU LIVE AND CHOICES YOU MAKE		
Jet Plane travel for each 1,000 miles	+ 1	+_____
The following are man made sources or radiation exposure		
Fallout from weapons testing (actually less than 1)		+ 1
If you watch TV (true value less than 1)	+ 1	+_____
Use a computer monitor	+ 1	+_____
For smoke detectors in your home (0.008)	+ 0	+_____
Transportation of Radioactive Materials (0.1)	+ 0	+_____
Low Level Radioactive Waste Burial Site	+ 1	+_____
Live within 50 miles of coal-fired power plant (0.03)	+ 0	+_____
Enhanced Sources (natural radiation increased by human activity)		
Consumer Products and enhanced sources such as radon in water and second hand tobacco smoke)		+ 10
Smoking 1 pack of cigarettes per day	+8000	+_____
Live within 50 miles of a nuclear reactor (0.009)	+ 0	+_____
Medical Exposures		
Diagnostic X-rays (dental, broken arms, legs, etc.) Average	+ 40	+_____
Nuclear Medical Procedures (thyroid scan)	+ 14	+_____
Cancer Treatments (range from 40,000 to 70,000 mrem)		+_____
TOTAL ANNUAL DOSE		**_____ mrem**